The Effect of Advances in Lung Cancer Treatment on Population Mortality by Subtype

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ORIGINAL ARTICLE

The Effect of Advances in Lung-Cancer Treatment on Population Mortality

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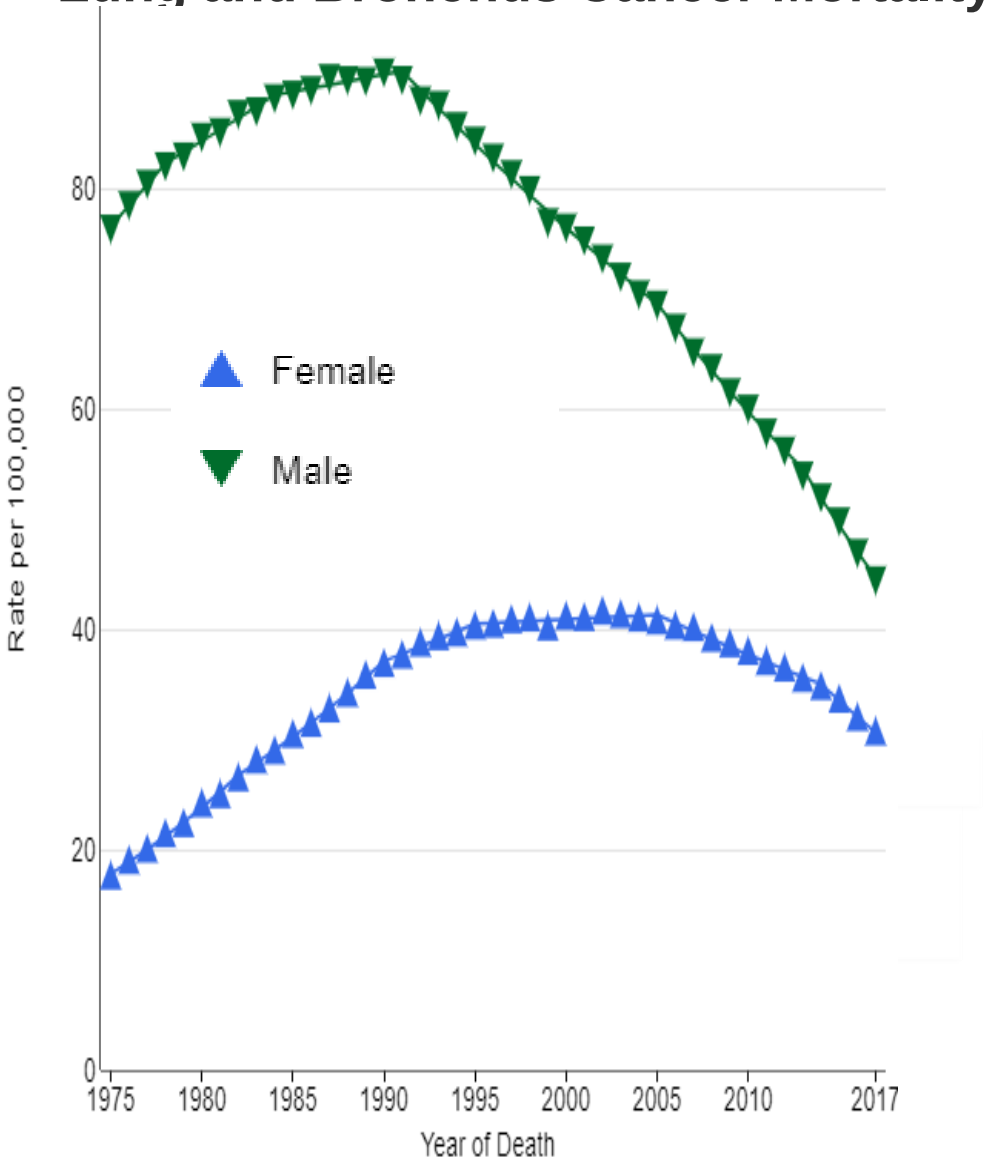
Background

Lung and Bronchus Cancer Mortality, US. 1975-2017



- Rapidly declining lung cancer mortality rates
- ACS reported largest one-year drop in cancer mortality; decline in deaths from lung cancer drove the record drop
- This captures overall trend from all subtypes combined
- How much do specific lung cancer subtype contribute to this overall trend in mortality?

ACS = American Cancer Society

Study Aims

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How do the two major subtypes contribute to the overall mortality decline?

- *Small cell (SCLC) and non-small cell lung cancer (NSCLC)*

Is the decline in the mortality more related to incidence or survival?

- *Mortality is influenced by both incidence and survival*

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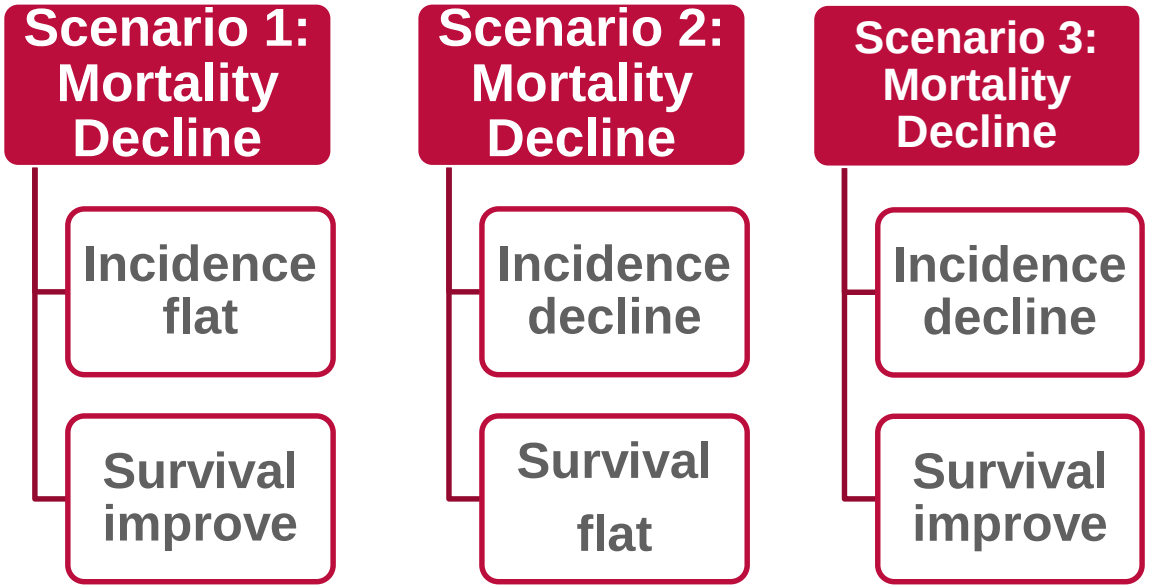


Study Design

Study Design: Analysis Cohort

Lung and bronchus cancer cases in SEER-18 areas during 2001-2016

- SEER-18 areas cover 28 percent of US population
- SCLC and NSCLC defined based on Lewis et al.[1]
- Coding challenges with classification of subtypes did not allow up to go back in time before 2001

[1] Lewis et al. Cancer 2014

Study Design: Methods

Use incidence-based mortality (IBM) technique to partition subtype-specific mortality trends

- Because regular death certificate mortality do not have subtypes
- Details to follow in a few slides
- Joinpoint to assess IBM trend changes over time

Assess incidence and survival trends to understand IBM trends

- Estimate age-adjusted incidence rates by subtypes
  - Further adjusted for reporting delay
  - Joinpoint to assess incidence trend changes over time
- Estimate two-year lung cancer-specific survival by subtypes
  - Relative survival approach

Incidence-Based Mortality (IBM)

Why Do We Need Incidence-Based Mortality (IBM)?

- Information on lung cancer subtypes not available on death certificate mortality data, but available from SEER data on incident cases
- IBM provides a resource to address this limitation in death certificate mortality data by linking SEER incident cases to mortality records
- Therefore, we can use information on deaths in SEER cases to reconstruct mortality curves using IBM

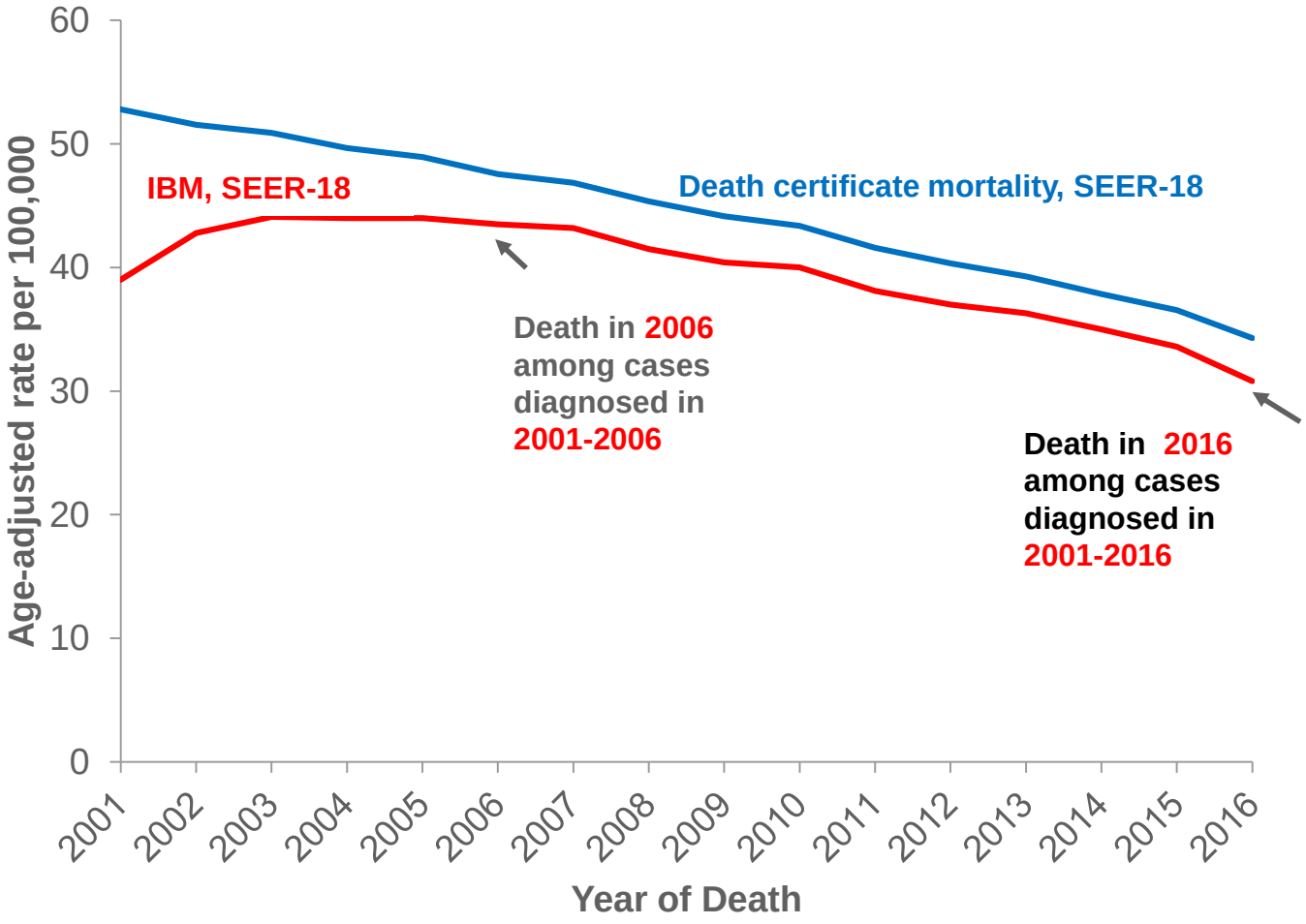
What Is Incidence-Based Mortality (IBM)?

IBM is a rate:

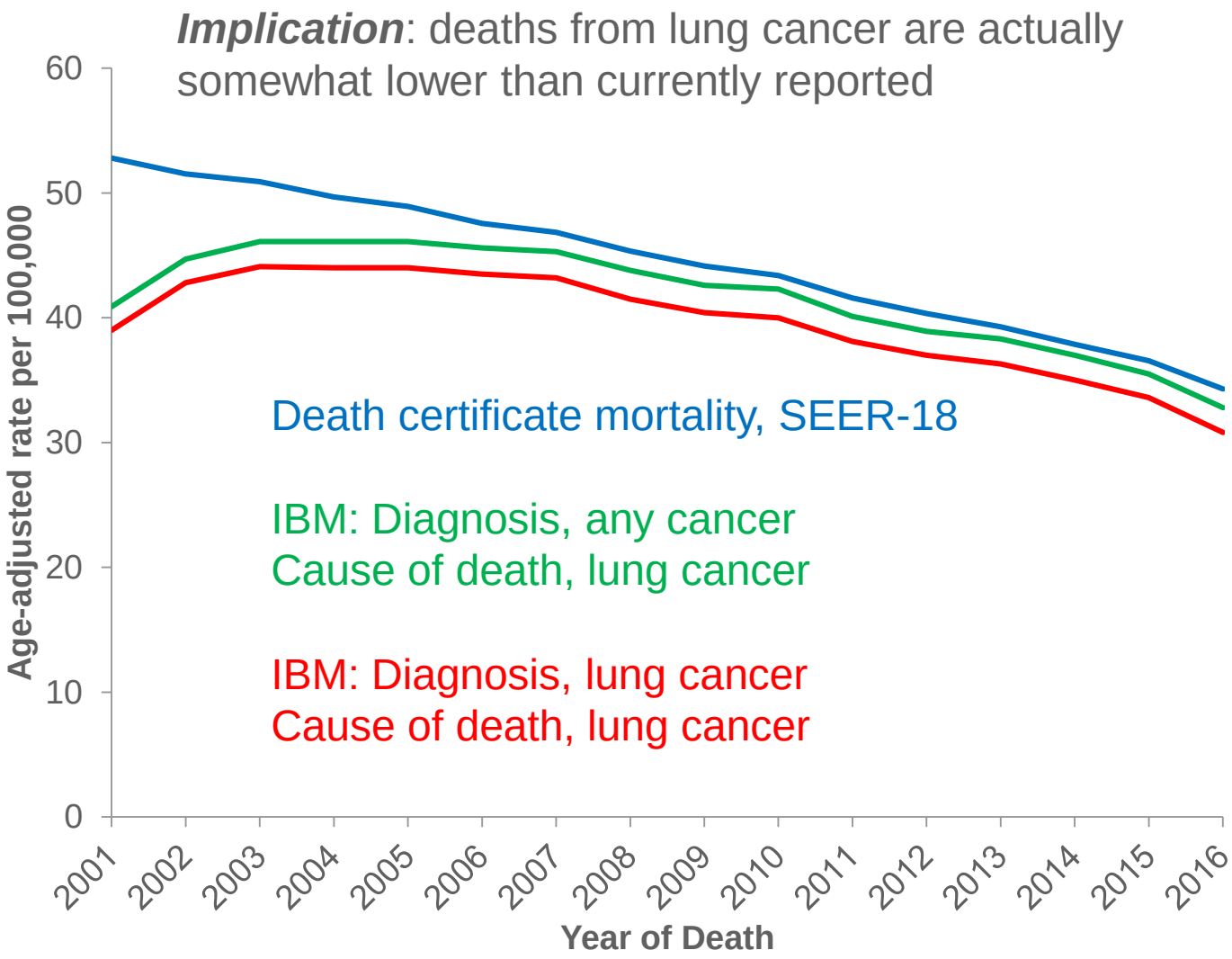
$$\frac{\text{Death among incident cases by subtypes in year 'x'}}{\text{General population in SEER areas in year 'x'}}$$

- IBM rates are valid for a shorter period of time than death certificate mortality rates
- Require 'n' years of data on incident cases prior to each year of mortality data to account for 'burn-in' period

Death Certificate Mortality vs. Incidence-based Mortality (IBM): Lung and Bronchus



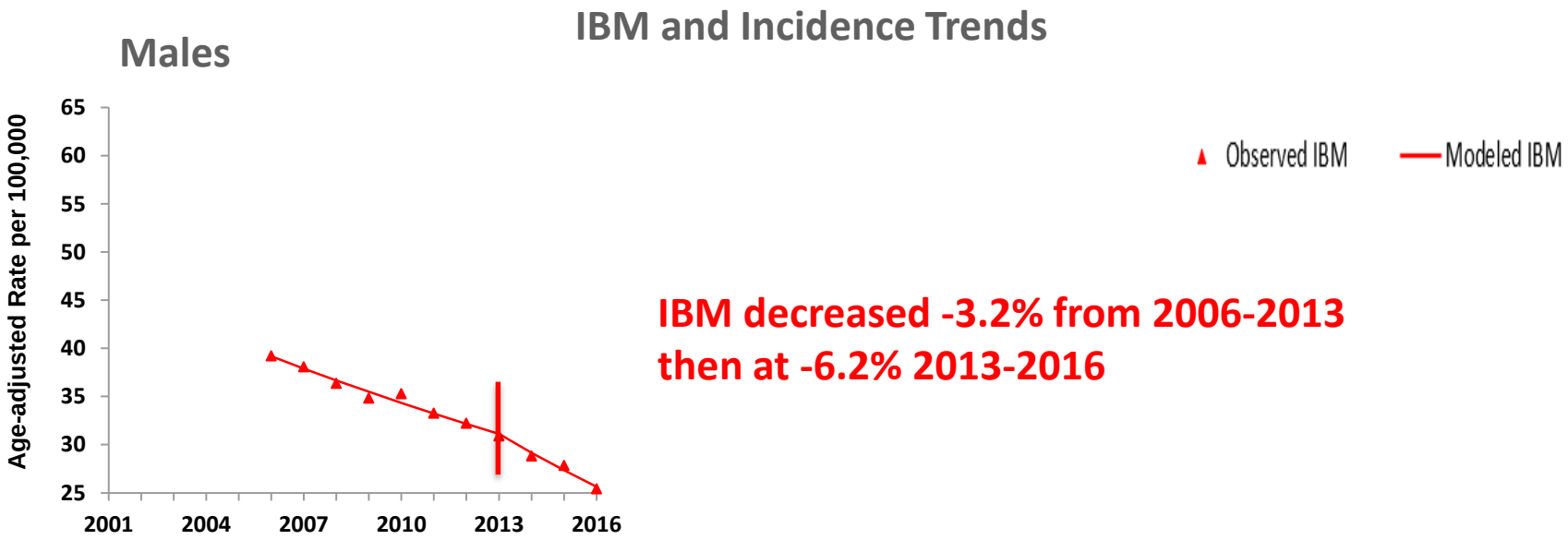
IBM likely represent lung cancer mortality more accurately than using death certificate mortality



Results

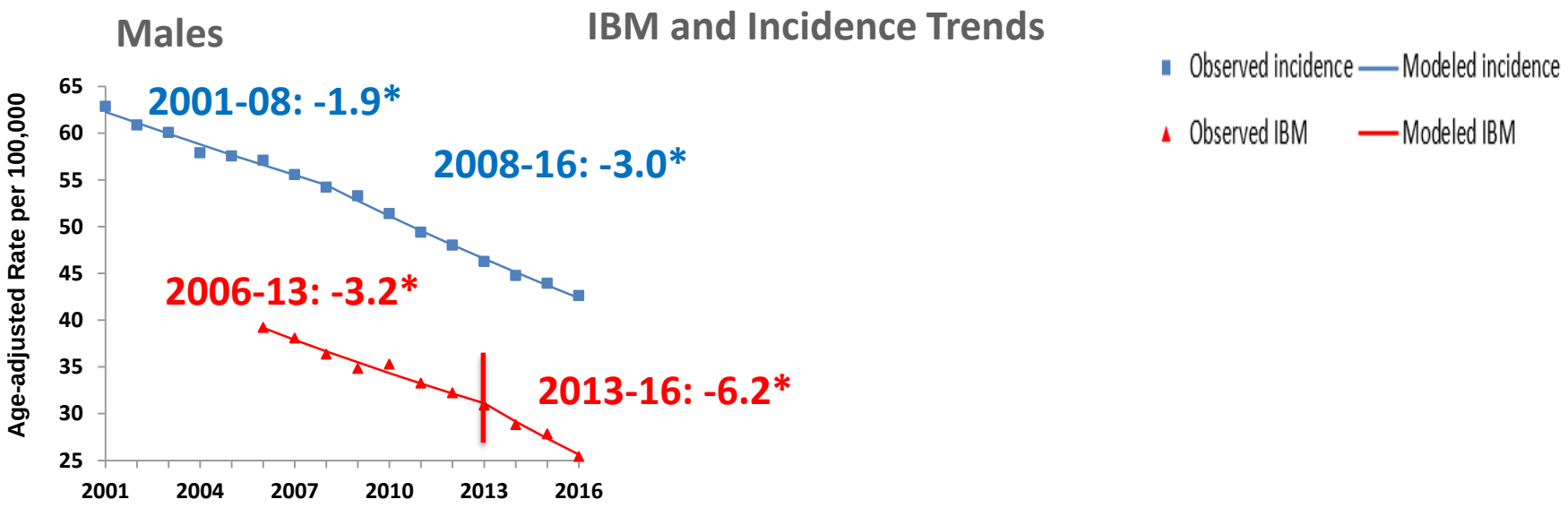
Non-Small Cell Lung Cancer

NSCLC: IBM, Incidence, and Survival Trends, SEER-18



IBM decreased -3.2% from 2006-2013 then at -6.2% 2013-2016

NSCLC: IBM, Incidence, and Survival Trends, SEER-18



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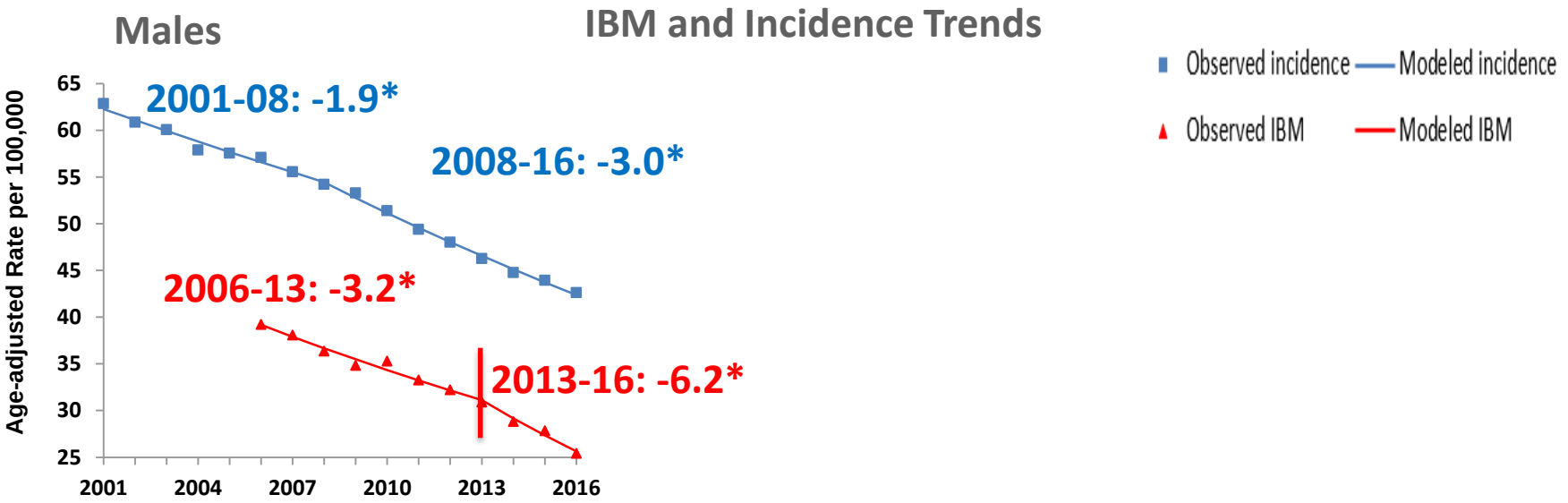

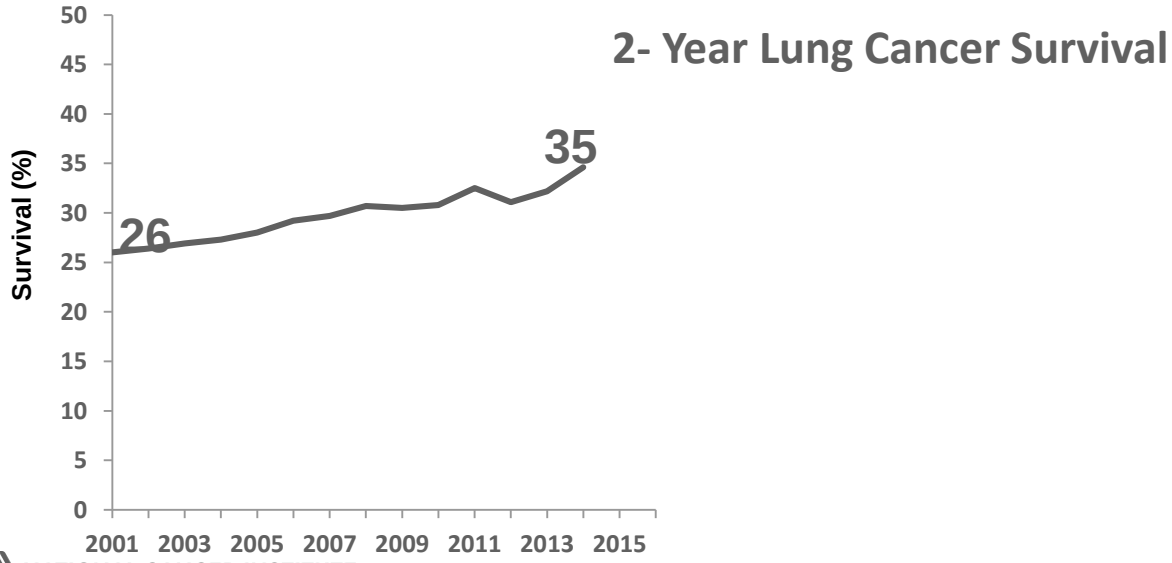

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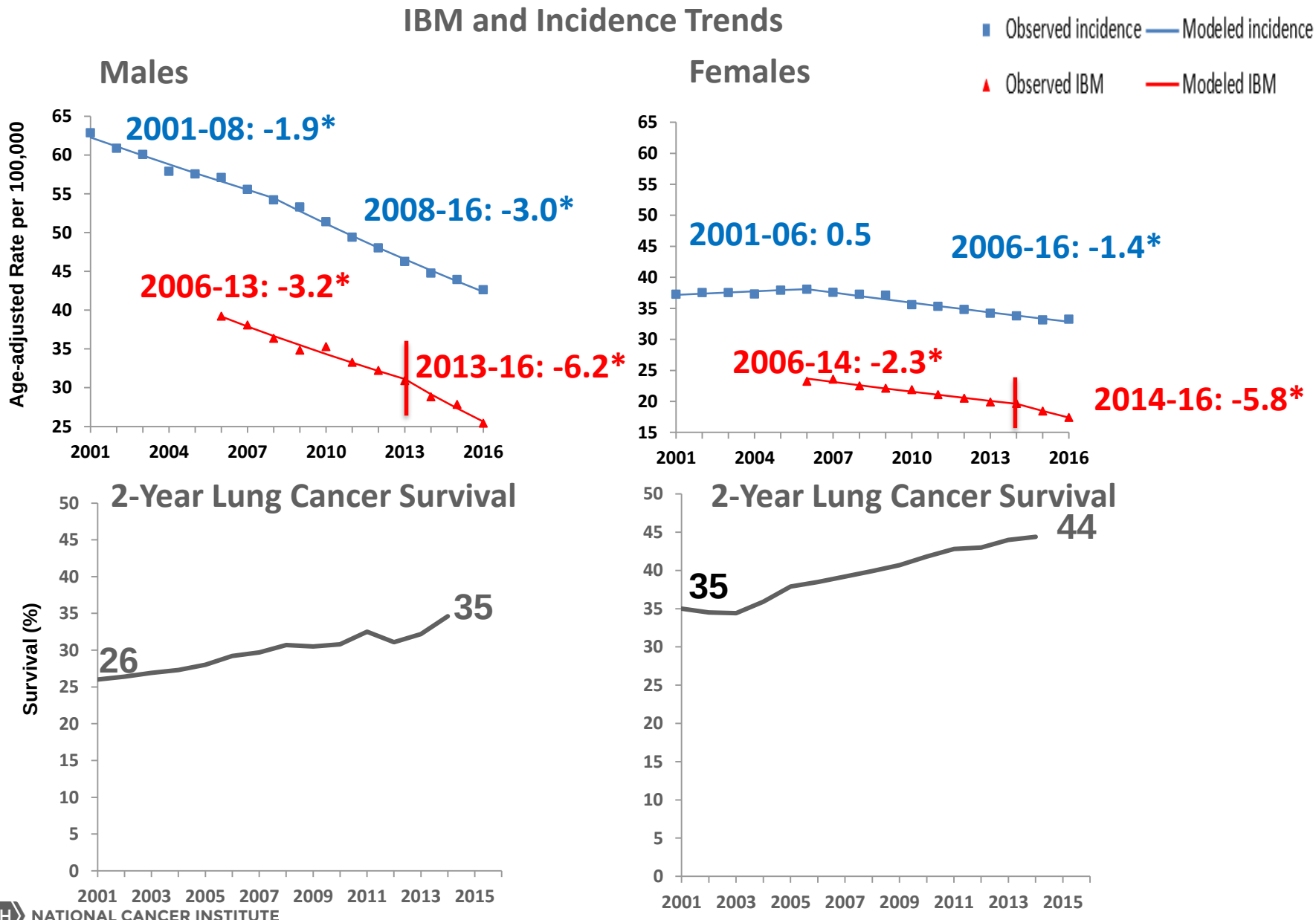
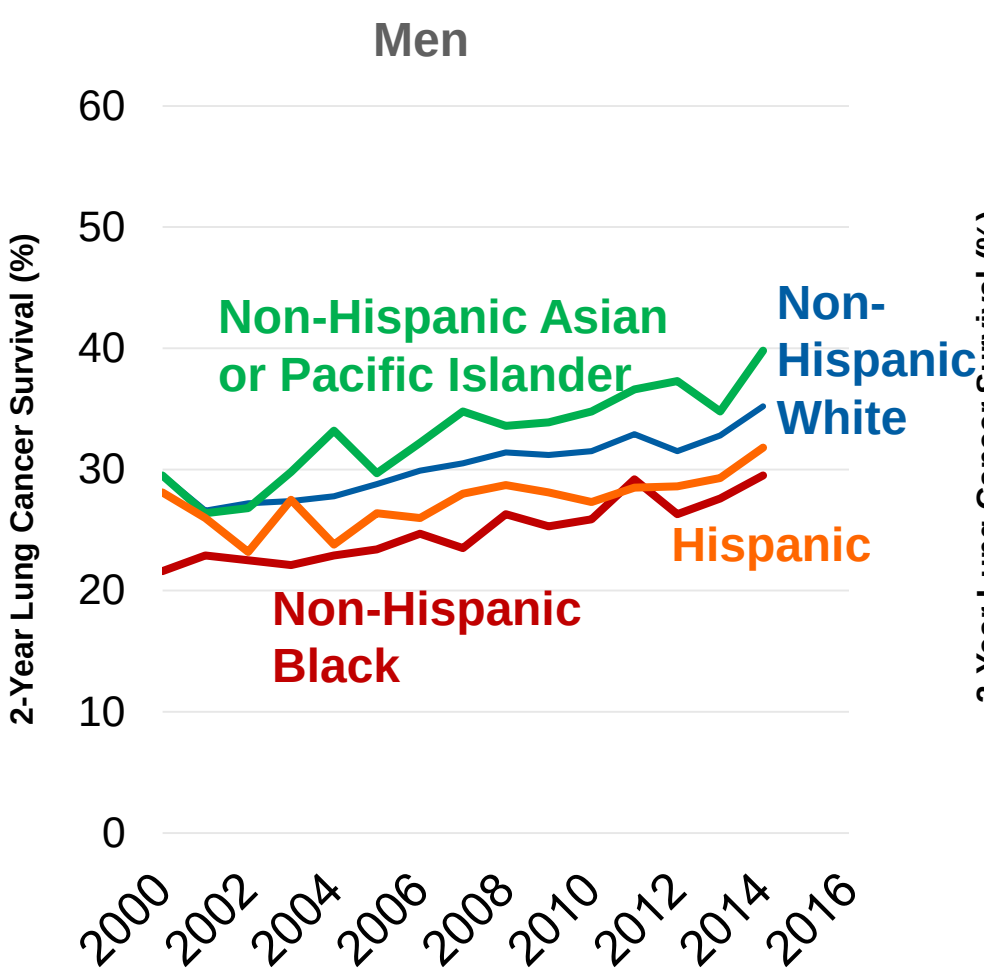
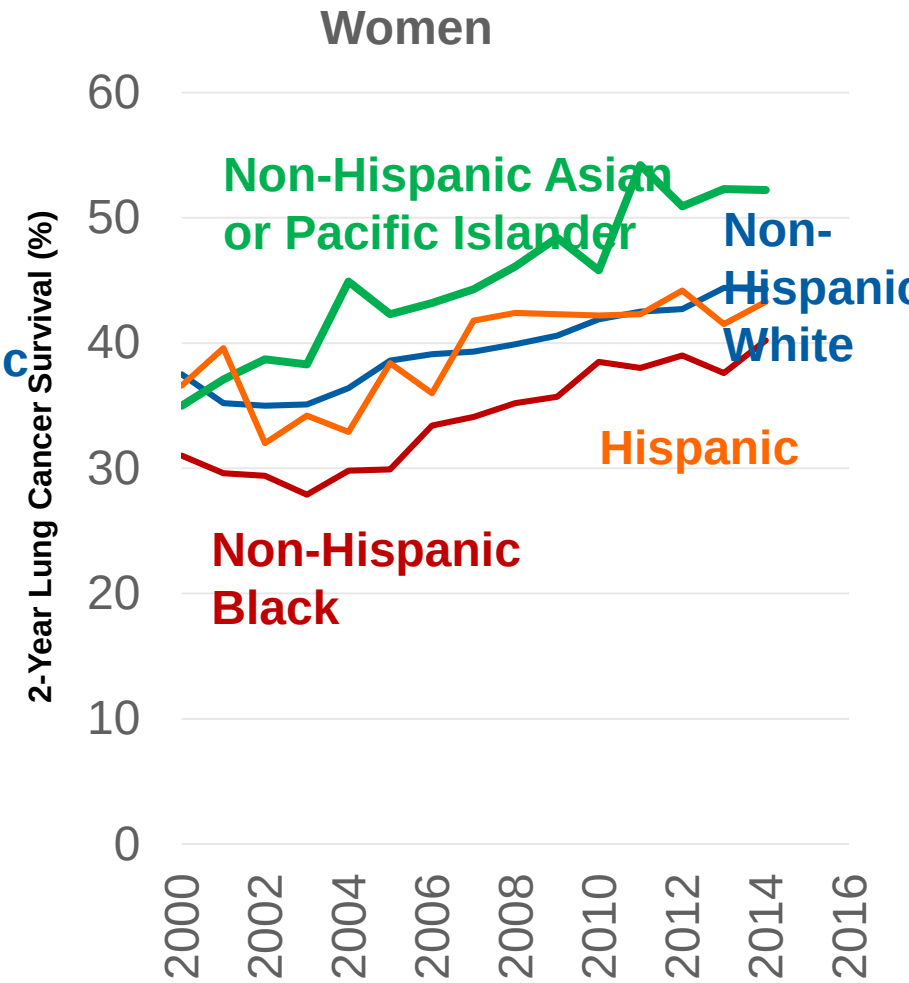


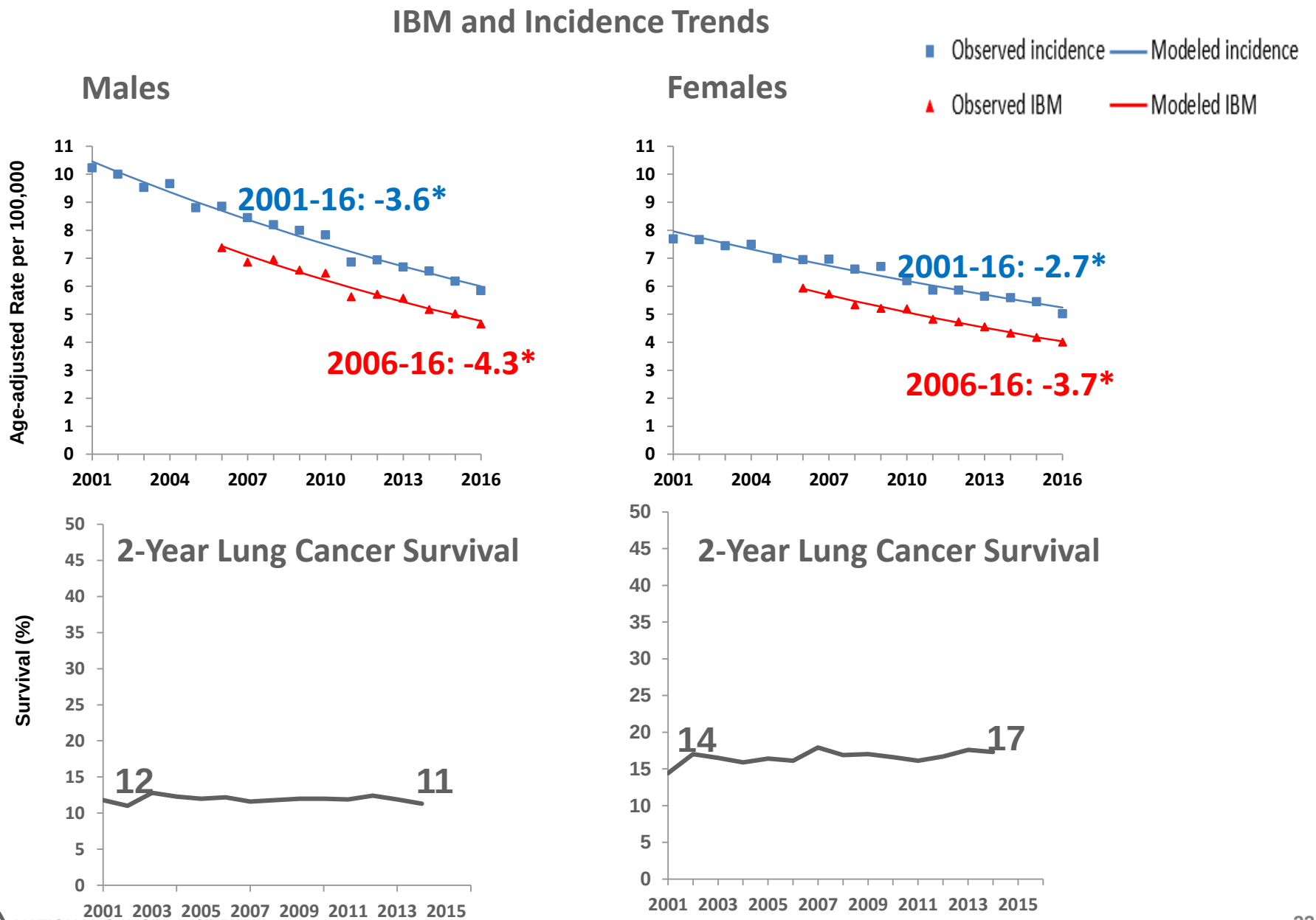
NSCLC Survival Trends by Race-ethnicity and Gender, SEER-18 excluding Alaska, 2000-2014





Small Cell Lung Cancer

SCLC: IBM, Incidence, and Survival Trends, SEER-18



Interpretation of the trends

Could other factors explain the sharper drop in NSCLC mortality?

Lung cancer screening?

- No because screening rates remained low and stable through out the study period

Declining smoking rates?

- Undoubtably, the declining smoking rates contribute to the declining incidence and mortality rates for lung cancer over time,
- But given the timing and magnitude of the drop, smoking alone did not explain

Targeted therapies?

- It correlated with several targeted therapies that were
- Approved by the U.S. Food and Drug Administration in 2013

Conclusions

Conclusions

SCLC: steady decline in mortality explained entirely by lower incidence (potentially attributable to reduced tobacco use)

NSCLC: steady decline initially followed by rapid decline in 2013-2016

- Mainly explained by dissemination of targeted therapies approved in 2013 for stage IV EGFR+NSCLC as first line therapy
- Estimates suggest possible population level impacts of targeted therapies

SEER currently do not have data on individual level drug use but has started a collaboration with Department of Energy to

- Enable collection of cancer surveillance data from multiple sources including detailed treatment, biomarkers along with decrease the interval for reporting
- Create detailed longitudinal patient trajectories

Thank you!